

EXERCISES

For more practice, see *Extra Practice*.

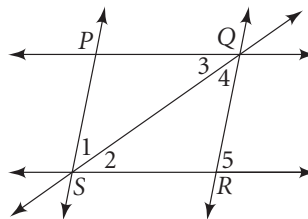
Practice and Problem Solving

A Practice by Example

Examples 1, 2
(pages 115, 116)

Name the two lines and the transversal that form each pair of angles. Then classify the pair of angles.

- $\angle 2$ and $\angle 3$
- $\angle 1$ and $\angle 4$
- $\angle SPQ$ and $\angle PQR$
- $\angle 5$ and $\angle PSR$



Classify each pair of angles labeled in the same color as *alternate interior angles*, *same-side interior angles*, or *corresponding angles*.

- Diagram with two transversals intersecting two lines. Angles 1 (pink), 2 (pink), 3 (blue), 4 (blue), 5 (blue), 6 (blue) are labeled.
- Diagram with two transversals intersecting two lines. Angles 1 (pink), 2 (pink), 3 (blue), 4 (blue), 5 (blue), 6 (blue) are labeled.
- Diagram with two transversals intersecting two lines. Angles 1 (pink), 2 (pink), 3 (blue), 4 (blue), 5 (blue), 6 (blue) are labeled.

- The boards securing this barn door suggest two parallel lines and a transversal. Classify $\angle 1$ and $\angle 2$ as alternate interior angles, same-side interior angles, or corresponding angles.



Example 3
(page 117)

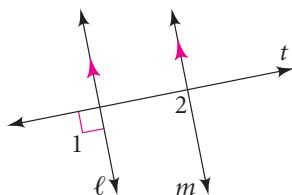
- Developing Proof** Complete the plan for a proof of the following statement.

If two lines are parallel and one of them is perpendicular to a transversal, then so is the other.

Given: $\ell \parallel m, \ell \perp t$

Prove: $m \perp t$

Plan: To prove $m \perp t$, show that **a.** $\angle ?$ is a right angle. $\angle 2$ is a right angle if it is congruent to **b.** $\angle ?$. $\angle 2 \cong \angle 1$ because $\ell \parallel m$ and **c.** $\angle ?$ angles are congruent.

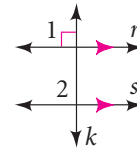


10. Developing Proof Supply the missing reasons in this two-column proof.

In a plane, if a line is perpendicular to one of two parallel lines, then it is perpendicular to the other.

Given: $k \perp r, r \parallel s$

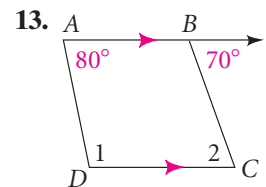
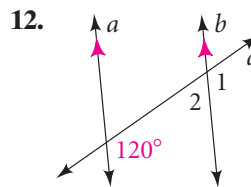
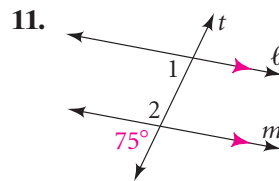
Prove: $k \perp s$



Statements	Reasons
1. $k \perp r$	1. Given
2. $\angle 1$ is a right angle.	a. ?
3. $m\angle 1 = 90$	b. ?
4. $r \parallel s$	4. Given
5. $m\angle 2 = m\angle 1$	c. ?
6. $m\angle 2 = 90$	d. ?
7. $\angle 2$ is a right angle.	e. ?
8. $k \perp s$	f. ?

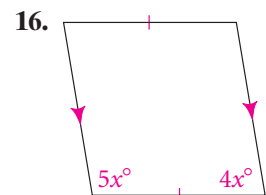
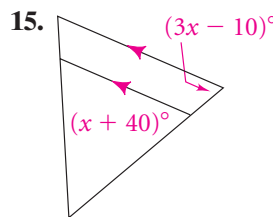
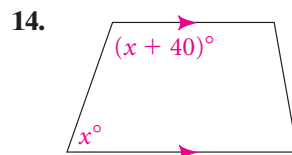
Example 4
(page 118)

Find $m\angle 1$, and then $m\angle 2$. Justify each answer.



Example 5
(page 118)

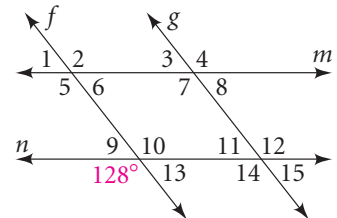
x² Algebra Find the value of x . Then find the measure of each labeled angle.



B Apply Your Skills

17. In the figure at the right, $f \parallel g$ and $m \parallel n$. Find the measure of each numbered angle.

18. Two pairs of parallel segments form the “pound sign” on your telephone keypad. To find the measures of all the angles in the pound sign, how many angles must you measure? Explain.



Two lines and a transversal form how many pairs of the following?

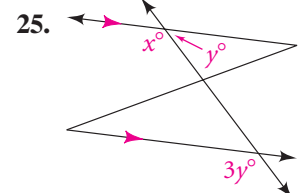
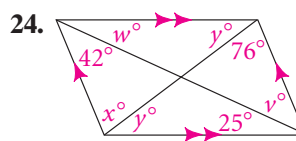
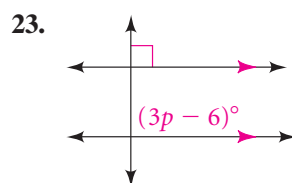
- | | |
|-------------------------------|--------------------------|
| 19. alternate interior angles | 20. corresponding angles |
| 21. same-side interior angles | 22. vertical angles |



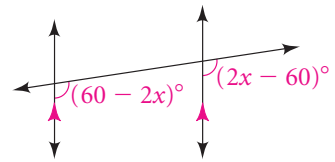
Need Help?

In Exercise 24, turn your book so the other two parallel lines appear horizontal.

x² Algebra Find the values of the variables.



26. **Error Analysis** The diagram at the right contains contradictory information. What is it? Why is it contradictory?

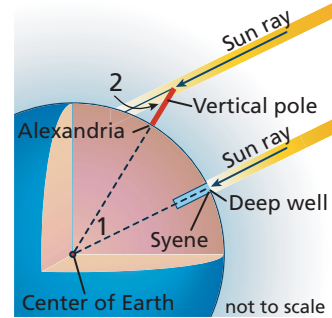


27. **Writing** Look up the meaning of the prefix *trans*. Explain how the meaning of the prefix relates to the word *transversal*.

28. **Open-Ended** The letter Z illustrates alternate interior angles. Find at least two other letters that illustrate the pairs of angles presented in this lesson. Draw the letters, mark the angles, and describe them.



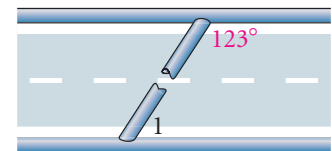
29. **History** About 220 B.C., Eratosthenes estimated the circumference of Earth. He achieved this remarkable feat by using two locations in Egypt. He assumed that Earth is a sphere and that the sun's rays are parallel. He used the measures of $\angle 1$ and $\angle 2$ in his estimation.



- Classify $\angle 1$ and $\angle 2$ as alternate interior, same-side interior, or corresponding angles.
- How did Eratosthenes know that $\angle 1 \cong \angle 2$?



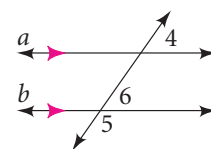
30. **Engineering** Engineers are laying pipe below ground on opposite sides of the street as shown here. To join the pipe, workers on each side of the street work towards the middle.



- If one team lays pipe at the angle shown, what should the other team use for $m\angle 1$?
- Are these two angles alternate interior, same-side interior, or corresponding angles?

Challenge

31. **Critical Thinking** $\angle 4$ and $\angle 5$ are same-side exterior angles.
- Make a conjecture about same-side exterior angles formed by two parallel lines and a transversal.
 - Prove your conjecture or show a counterexample.



Proof

32. **Developing Proof** $\angle 1$ and $\angle 3$ are alternate exterior angles. Follow the plan for a proof and write a two-column proof of the following statement.

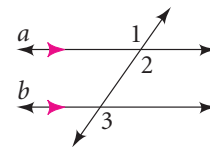
If a transversal intersects two parallel lines, then alternate exterior angles are congruent.

Given: $a \parallel b$

Prove: $\angle 1 \cong \angle 3$

Plan: To prove that $\angle 1 \cong \angle 3$, show that $\angle 1 \cong \angle 2$ and $\angle 2 \cong \angle 3$.

$\angle 1 \cong \angle 2$ because vertical \angle s are congruent. $\angle 2 \cong \angle 3$ because corresponding \angle s are congruent. Thus, $\angle 1 \cong \angle 3$ by the Transitive Property of Congruence.



Line m is in plane A and line n is in plane B. Planes A and B are parallel. Complete each statement with *sometimes*, *always*, or *never*. Justify each answer.

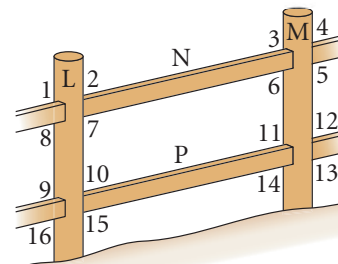
- Lines m and n ? intersect.
- Lines m and n are ? coplanar.
- Lines m and n are ? parallel.
- Lines m and n are ? skew.



Standardized Test Prep

Multiple Choice

A fence on a hill uses vertical posts L and M to hold parallel rails N and P. Use the diagram for Exercises 37–41.



37. $\angle 10$ and $\angle 14$ are alternate interior angles. Which is the transversal?

A. L B. M
C. N D. P

38. If $m\angle 1 = 115$, what is $m\angle 16$?

F. 35 G. 65 H. 85 I. 115

39. If $m\angle 10 = x - 24$, what is $m\angle 7$?

A. $156 + x$ B. $204 + x$ C. $156 - x$ D. $204 - x$

40. If $m\angle 1 = 6x$ and $m\angle 12 = 4x$, what is $m\angle 5$?

F. 54 G. 60 H. 72 I. 108

41. a. Describe a plan for showing that $\angle 1 \cong \angle 5$.

b. Explain why $\angle 1 \cong \angle 5$. Justify each step.



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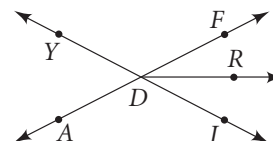
Short Response

Mixed Review

Lesson 2-5

Find the measure of each angle if $m\angle YDF = 121$ and \overrightarrow{DR} bisects $\angle FDI$.

42. $\angle IDA$ 43. $\angle YDA$ 44. $\angle RDI$



Lesson 1-6

Coordinate Geometry Find the coordinates of the midpoint of \overline{AB} .

45. $A(0, 9), B(1, 5)$ 46. $A(-3, 8), B(2, -1)$ 47. $A(10, -1), B(-4, 7)$

Lesson 1-1

Find a pattern for each sequence. Use the pattern to show the next two terms.

48. 4, 8, 12, 16, ... 49. 1, -2, 4, -8, ... 50. 23, 16, 9, 2, ...